Volume 166 2005

New Phytologist

International Journal of Plant Science

Blackwell
Publishing

© 2005 *New Phytologist*
Published by Blackwell Publishing Ltd.
9600 Garsington Road, Oxford OX4 2DQ, UK
Blackwell Publishing, Inc., Commerce Place, 350 Main Street, Malden, MA 02148-5018, USA
Blackwell Publishing Asia, 550 Swanston Street, Carlton South, Victoria 3053, Australia
Blackwell Verlag, Kurfürstendamm 57, 10707 Berlin, Germany
Blackwell Munksgaard, 1 Rosenørns Allé, PO Box 227, DK-1502, Copenhagen V, Denmark
Blackwell Publishing Japan/Blackwell Publishing Asia, 5F, GS Chiyoda Building, 3-11-14 Iidabashi, Chiyoda-Ku, Tokyo 102-0072, Japan
Blackwell Publishing Professional, 2121 State Avenue, Ames, IA 50614-8300, USA

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, recording, or otherwise, without the prior permission of the copyright owner. Authorisation to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by Blackwell Publishing for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of $15.00 per copy is paid directly to CCC, 222 Rosewood Drive, Suite 910, Danvers, MA 01973, USA. This consent does not extend to other kinds of copying such as copying for general distribution, for advertising or promotional purposes, for creating new collective works or for resale. Special requests should be addressed to the Publisher.

Typeset by Graphicraft Limited Hong Kong
and printed and bound in the UK

Contents

Volume 166 Number 1 April 2005

CONTENTS

Forum

Commentary

1 **Feature:** Plant ecological development • **Evolution:** Ancient and recent polyploidy in angiosperms

Review

Tansley reviews

9 The control of leaf development
A. J. Fleming

21 The evolution of Ca^{2+} signalling in photosynthetic eukaryotes
J. H. F. Bothwell & C. K.-Y. Ng

Research reviews

39 Plant eco-devo: the potential of poplar as a model organism
Q. C. B. Cronk

49 Constraints on the evolution of adaptive phenotypic plasticity in plants
M. van Kleunen & M. Fischer

61 Plant growth forms: an ecological and evolutionary perspective
N. Rowe & T. Speck

73 A modular concept of phenotypic plasticity in plants
H. de Kroon, H. Huber, J. F. Stuefer & J. M. van Groenendael

83 Niche construction through phenological plasticity: life history dynamics and ecological consequences
K. Donohue

93 Maternal effects provide phenotypic adaptation to local environmental conditions
L. F. Galloway

101 Evolution of phenotypic plasticity: patterns of plasticity and the emergence of ecotypes
G. de Jong

119 Evolutionary consequences of gender plasticity in genetically dimorphic breeding systems
L. F. Delph & D. E. Wolf

Research

Full papers

129 Plasticity genes and plasticity costs: a new approach using an *Arabidopsis* recombinant inbred population
H. S. Callahan, N. Dhanoolal & M. C. Ungerer

141 Shade tolerance plasticity in response to neutral vs green shade cues in *Polygonum* species of contrasting ecological breadth
T. M. Griffith & S. E. Sultan

149 Relationships among growth, development and plastic response to environment quality in a perennial plant
K. S. Moriuchi & A. A. Winn

159 Optimal reproductive allocation in annuals and an informational constraint on plasticity
T. G. Wong & D. D. Ackerly

173 A comparison of phenotypic plasticity in the native dandelion *Taraxacum ceratophorum* and its invasive congener *T. officinale*
M. T. Brock, C. Weinig & C. Galen

185 Expression of fission yeast *cdc25* driven by the wheat ADP-glucose pyrophosphorylase large subunit promoter reduces pollen viability and prevents transmission of the transgene in wheat
D. Chrimes, H. J. Rogers, D. Francis, H. D. Jones & C. Ainsworth

193 Seasonal adaptations of the tuberous roots of *Ranunculus asiaticus* to desiccation and resurrection by changes in cell structure and protein content
R. Kamenetsky, R. L. Peterson, L. H. Melville, C. F. Machado & J. D. Bewley

205 Temperature dependence of leaf-level CO_2 fixation: revising biochemical coefficients through analysis of leaf three-dimensional structure
E. Juurola, T. Aalto, T. Thum, T. Vesala & P. Hari

217 A trade-off between nitrogen uptake and use increases responsiveness to elevated CO_2 in infrequently cut mixed C_3 grasses
J.-F. Soussana, F. Teyssonneyre, C. Picon-Cochard & L. Dawson

231 Occurrence of nodulation in unexplored leguminous trees native to the West African tropical rainforest and inoculation response of native species useful in reforestation
M. Diabate, A. Munive, S. M. de Faria, A. Ba, B. Dreyfus & A. Galiana

241 Infection of Chinese cabbage by *Plasmodiophora brassicae* leads to a stimulation of plant growth: impacts on cell wall metabolism and hormone balance
S. Devos, K. Vissenberg, J.-P. Verbelen & E. Prinsen

251 Contrasting below-ground views of an ectomycorrhizal fungal community
R. T. Koide, B. Xu & J. Sharda

263 Phylogenetic divergence in a local population of the ectomycorrhizal fungus *Cenococcum geophilum*
G. W. Douhan & D. M. Rizzo

273 AFLP analyses demonstrate genetic divergence, hybridization, and multiple polyploidization in the evolution of *Achillea* (Asteraceae-Anthemideae)
Y.-P. Guo, J. Saukel, R. Mittermayr & F. Ehrendorfer
• **Commentary p. 5**

291 Preferential elimination of repeated DNA sequences from the paternal, *Nicotiana tomentosiformis* genome donor of a synthetic, allotetraploid tobacco
K. Skalická, K. Y. Lim, R. Matyasek, M. Matzke, A. R. Leitch & A. Kovarik
• **Commentary p. 5**

305 Evolution under domestication: contrasting functional morphology of seedlings in domesticated cassava and its closest wild relatives
B. Pujol, G. Mühlen, N. Garwood, Y. Horoszowski, E. J. P. Douzery & D. McKey

Methods

319 Statistical convenience vs biological insight: consequences of data transformation for the analysis of fitness variation in heterogeneous environments
M. L. Stanton & D. A. Thiede

339 Image analysis and *in vivo* imaging as tools for investigation of productivity dynamics in anthocyanin-producing cell cultures of *Daucus carota*
S. Ceoldo, M. Levi, A. M. Marconi, G. Baldan, M. Giarola & F. Guzzo

353 Corrigendum

Volume 166 Number 2 May 2005

CONTENTS

Forum

Commentary

355 **Environment:** Leaf form and the reconstruction of past climates • **Interaction:** Unearthing ectomycorrhizal dynamics • **Evolution:** Linking mutation to adaptation: overcoming stress at the spa

Analysis

363 Linking tocopherols with cellular signaling in plants

Meetings

367 Data–model integration is not magic

Review

Tansley reviews

371 Sulfur and phytoplankton: acquisition, metabolism and impact on the environment
M. Giordano, A. Norici & R. Hell

383 Form, function and environments of the early angiosperms: merging extant phylogeny and ecophysiology with fossils
T. S. Feild & N. C. Arens

Research reviews

409 Ancient plant DNA: review and prospects
F. Gugerli, L. Parducci & R. J. Petit

Research

Rapid reports

419 Isoprene decreases the concentration of nitric oxide in leaves exposed to elevated ozone
V. Velikova, P. Pinelli, S. Pasqualini, L. Reale, F. Ferranti & F. Loreto

Full papers

427 The light-hyperresponsive *high pigment-2^{hp}* mutation of tomato: alterations in the fruit metabolome
R. J. Bino, C. H. R. de Vos, M. Lieberman, R. D. Hall, A. Bovy, H. H. Jonker, Y. Tikunov, A. Lommen, S. Moco & I. Levin

439 The rhizosphere signal molecule lumichrome alters seedling development in both legumes and cereals
V. N. Matiru & F. D. Dakora

445 Induced plant uptake and transport of mercury in the presence of sulphur-containing ligands and humic acid
F. N. Moreno, C. W. N. Anderson, R. B. Stewart, B. H. Robinson, M. Ghomshei & J. A. Meech

455 Genetic characterization of androgenic progeny derived from *Lolium perenne* × *Festuca pratensis* cultivars
Y. Guo, Y. Mizukami & T. Yamada

465 Environmental signals from leaves – a physiognomic analysis of European vegetation
C. Traiser, S. Klotz, D. Uhl & V. Mosbrugger
• Commentary p. 355

485 Assessing the generality of global leaf trait relationships
I. J. Wright, P. B. Reich, J. H. C. Cornelissen, D. S. Falster, E. Garnier, K. Hikosaka, B. B. Lamont, W. Lee, J. Oleksyn, N. Osada, H. Poorter, R. Villar, D. I. Warton & M. Westoby

497 Variation in the degree of coupling between $\delta^{13}C$ of phloem sap and ecosystem respiration in two mature *Nothofagus* forests
M. M. Barbour, J. E. Hunt, R. J. Dungan, M. H. Turnbull, G. W. Brailsford, G. D. Farquhar & D. Whitehead

513 Atmospheric CO_2 enrichment alters energy assimilation, investment and allocation in *Xanthium strumarium*
J. M. Nagel, X. Wang, J. D. Lewis, H. A. Fung, D. T. Tissue & K. L. Griffin

525 Differential effects of interspecific interactions and water availability on survival, growth and fecundity of three congeneric grassland herbs
R. L. Eckstein

537 High nitrogen : phosphorus ratios reduce nutrient retention and second-year growth of wetland sedges
S. Güsewell

551 Decline of acid-sensitive plant species in heathland can be attributed to ammonium toxicity in combination with low pH
L. J. L. van den Berg, E. Dorland, P. Vergeer, M. A. C. Hart, R. Bobbink & J. G. M. Roelofs

565 The importance of nitrogen and carbohydrate storage for plant growth of the alpine herb *Veratrum album*
D. Kleijn, U. A. Treier & H. Müller-Schärer

577 Phyllosphere nitrogen relations: reciprocal transfer of nitrogen between epiphyllous liverworts and host plants in the understorey of a lowland tropical wet forest in Costa Rica
W. Wanek & K. Pörtl

589 Plant–microbe interactions: identification of epiphytic bacteria and their ability to alter leaf surface permeability
L. Schreiber, U. Krimm, D. Knoll, M. Sayed, G. Auling & R. M. Kroppenstedt

595 Radiocarbon – a low-impact tool to study nutrient transport by soil fungi under field conditions
C. I. Czimczik, K. K. Treseder, M. S. Carbone & S. E. Trumbore

601 Does the presence of arbuscular mycorrhizal fungi influence growth and nutrient uptake of a wild-type tomato cultivar and a mycorrhiza-defective mutant, cultivated with roots sharing the same soil volume?
E. Neumann & E. George

611 Metabolic activity of *Glomus intraradices* in *Arum*- and *Paris*-type arbuscular mycorrhizal colonization
I. M. van Aarle, T. R. Cavagnaro, S. E. Smith, F. A. Smith & S. Dickson

619 Detection of plot-level changes in ectomycorrhizal communities across years in an old-growth mixed-conifer forest
A. Izzo, J. Agbowo & T. D. Bruns
• Commentary p. 358

631 Priority effects determine the outcome of ectomycorrhizal competition between two *Rhizopogon* species colonizing *Pinus muricata* seedlings
P. G. Kennedy & T. D. Bruns

639 Mixotrophy in orchids: insights from a comparative study of green individuals and nonphotosynthetic individuals of *Cephalanthera damasonium*
T. Julou, B. Burghardt, G. Gebauer, D. Berveiller, C. Damesin & M.-A. Selosse

655 Adaptation of *Spirogyra insignis* (Chlorophyta) to an extreme natural environment (sulphureous waters) through preselective mutations
A. Flores-Moya, E. Costas, E. Bañares-España, L. García-Villada, M. Altamirano & V. López-Rodas
• Commentary p. 360

663 Local genetic differentiation among populations of the mass-flowering tropical shrub *Erythroxylum havanense* (Erythroxylaceae)
C. A. Domínguez, C. A. Abarca, L. E. Eguiarte & F. Molina-Freaner

673 Reproductive compensation in the evolution of plant mating systems
E. Porcher & R. Lande

685 Maternal effects and heterosis influence the fitness of plant hybrids
H. Kirk, K. Vrieling & P. G. L. Klinkhamer

Methods

695 Laser scanning reveals bryophyte canopy structure
S. K. Rice, C. Gutman & N. Krouglicof

Volume 166 Number 3 June 2005

CONTENTS

Forum

Commentary

705 **Feature:** Functional–structural plant modelling
• **Function:** Fructans and freezing tolerance

Letters

710 Leaf-level light compensation points in shade-tolerant woody seedlings

Meetings

713 Advances in forest tree genomics
717 Cell walls: the boundaries of plant development

Review

Tansley reviews

723 Forest fragmentation effects on patch occupancy and population viability of herbaceous plant species
O. Honnay, H. Jacquemyn, B. Bossuyt & M. Hermy

737 Impacts of parasitic plants on natural communities
M. C. Press & G. K. Phoenix

753 Plant immunophilins: functional versatility beyond protein maturation
P. Romano, J. Gray, P. Horton & S. Luan

Research reviews

771 New understanding on phloem physiology and possible consequences for modelling long-distance carbon transport
P. E. H. Minchin & A. Lacointe

781 Phylloclimate or the climate perceived by individual plant organs: What is it? How to model it? What for?
M. Chelle

791 Crown architecture in sun and shade environments: assessing function and trade-offs with a three-dimensional simulation model
R. W. Pearcy, H. Muraoka & F. Valladares

Research

Full papers

801 Towards a generic architectural model of tillering in Gramineae, as exemplified by spring wheat (*Triticum aestivum*)
J. B. Evers, J. Vos, C. Fournier, B. Andrieu, M. Chelle & P. C. Struik

813 Analysis of the plant architecture via tree-structured statistical models: the hidden Markov tree models
J.-B. Durand, Y. Guédon, Y. Caraglio & E. Costes

827 Performance of trees in forest canopies: explorations with a bottom-up functional–structural plant growth model
F. J. Sterck, F. Schieving, A. Lemmens & T. L. Pons

845 Using the canonical modelling approach to simplify the simulation of function in functional–structural plant models
M. Renton, J. Hanan, K. Burrage

859 Barley morphology, genetics and hormonal regulation of internode elongation modelled by a relational growth grammar
G. H. Buck-Sorlin, O. Kniemeyer & W. Kurth

869 Using L-systems for modeling source–sink interactions, architecture and physiology of growing trees: the L-PEACH model
M. T. Allen, P. Prusinkiewicz & T. M. DeJong

881 A functional–structural model of elongation of the grass leaf and its relationships with the phyllochron
C. Fournier, J. L. Durand, S. Ljutovac, R. Schäufele, F. Gastal & B. Andrieu

895 Jasmonates and Na-orthovanadate promote resveratrol production in *Vitis vinifera* cv. Barbera cell cultures
A. Tassoni, S. Fornalè, M. Franceschetti, F. Musiani, A. J. Michael, B. Perry & N. Bagni

907 Three loblolly pine *CesA* genes expressed in developing xylem are orthologous to secondary cell wall *CesA* genes of angiosperms
C. J. Nairn & T. Haselkorn

917 Cloning, characterization and functional analysis of novel 6-kestose exohydrolases (6-KEHs) from wheat (*Triticum aestivum*)
W. Van den Ende, M. Yoshida, S. Clerens, R. Vergauwen & A. Kawakami
• **Commentary p. 708**

933 Supply pre-emption, not concentration reduction, is the mechanism of competition for nutrients
J. M. Craine, J. Fargione & S. Sugita

941 Ozone foliar symptoms in woody plant species assessed with ultrastructural and fluorescence analysis
F. Bussotti, G. Agati, R. Desotgiu, P. Matteini & C. Tani

957 Is UV-B radiation affecting charophycean algae in shallow freshwater systems?
N. V. J. de Bakker, P. M. van Bodegom, W. H. van de Poll, P. Boelen, E. Nat, J. Rozema & R. Aerts

967 Conventional detection methodology is limiting our ability to understand the roles and functions of fine roots
A. Pierret, C. J. Moran & C. Doussan

981 Nitrogen supply affects arbuscular mycorrhizal colonization of *Artemisia vulgaris* in a phosphate-polluted field site
V. Blanke, C. Renker, M. Wagner, K. Füllner, M. Held, A. J. Kuhn & F. Buscot

993 Does proximity to mature trees influence ectomycorrhizal fungus communities of Douglas-fir seedlings?
E. T. Cline, J. F. Ammirati & R. L. Edmonds

1011 Diversity and specificity of ectomycorrhizal fungi retrieved from an old-growth Mediterranean forest dominated by *Quercus ilex*
F. Richard, S. Millot, M. Gardes & M-A. Selosse

1025 Seasonal changes in wood formation of *Ulmus pumila* and *U. minor* and its relation with Dutch elm disease
A. Solla, J. A. Martín, P. Corral & L. Gil

1035 The *Vh8* locus of a new gene-for-gene interaction between *Venturia inaequalis* and the wild apple *Malus sieversii* is closely linked to the *Vh2* locus in *Malus pumila* R12740-7A
V. G. M. Bus, F. N. D. Laurens, W. E.van de Weg, R. L. Rusholme, E. H. A. Rikkerink, S. E. Gardiner, H. C. M. Bassett, L. P. Kodde & K. M. Plummer

1051 The origin of a novel form of *Senecio* (Asteraceae) restricted to sand dunes in southern Sicily
M. A. Chapman & R. J. Abbott

Methods

1063 UNITE: a database providing web-based methods for the molecular identification of ectomycorrhizal fungi
U. Kõljalg, K.-H. Larsson, K. Abarenkov, R. H. Nilsson, I. J. Alexander, U. Eberhardt, S. Erland, K. Høiland, R. Kjøller, E. Larsson, T. Pennanen, R. Sen, A. F. S. Taylor, L. Tedersoo, T. Vrålstad & B. M. Ursing

1069 Author index

1075 Key word index